

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Serial No.: 10/797,876
Applicant: Anthony Dip et al.
Art Unit: 2811
Title: **SILICON GERMANIUM SURFACE LAYER FOR HIGH-K
DIELECTRIC INTEGRATION**
Attorney Docket: TPS-007
Confirmation No.: 5070

Cincinnati, OH

January 26, 2007

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

AFFIDAVIT UNDER RULE 131

We, the inventors, being duly cautioned and sworn, submit this Affidavit in response to the Office Action dated July 26, 2006, and state:

That we are the inventors of the invention entitled "SILICON GERMANIUM SURFACE LAYER FOR HIGH-K DIELECTRIC INTEGRATION" described and claimed in the application for Letters Patent of the United States, Serial No. 10/797,876 filed March 10, 2004 (the '876 application);

That this is an Affidavit under the provisions of Rule 131 and the rules of practice for the United States Patent Office in support of said '876 application;

That prior to February 16, 2004, the publication date of *Cho et al.*, Interfacial Characteristics of HfO₂ Films Grown on Strained SiGe by Atomic-Layer Deposition, Applied

Physics Letters, Vol. 84, No. 7, 02/16/2004, pp. 1171-73 (*Cho et al.*), the invention described and claimed in the present application was conceived in the United States of America;

That the invention was constructively reduced to practice by the filing of a patent application on March 10, 2004, which is after the February 16, 2004 publication date of *Cho et al.*;

That from just prior to February 16, 2004 to our filing date of March 10, 2004, we were diligent in our efforts to reduce the invention to practice;

That, as evidence of the conception of the invention described and claimed in the '876 application, attached and incorporated into this Affidavit are copies of original written records made by us, by persons from our in-house IP department, namely Tug Yasar and Audunn Ludviksson, or by our outside counsel, Kristi L. Davidson of Wood, Herron & Evans, bearing dates prior to February 16, 2004, but with said dates and other information masked;

That, as evidence of our diligence and the diligence of our legal representatives acting on our behalf in constructively reducing the invention claimed in the '876 application to practice, attached and incorporated into this Affidavit are copies of original written records made by us, by persons from our in-house IP department, namely Audunn Ludviksson, or by our outside counsel, Kristi L. Davidson, bearing dates that span from just prior to February 16, 2004 up to our filing date of March 10, 2004;

That the attached Exhibits include letters and email correspondence from Tugrul Yasar to outside counsel, Donald F. Frei of Wood, Herron & Evans, and between Audunn Ludviksson and outside counsel, Kristi L. Davidson of Wood, Herron & Evans, which clearly demonstrate that the '876 application was prepared and finalized on or before February 16, 2004,

and thus the features and advantages of the present invention, as claimed in the '876 application, were conceived prior to February 16, 2004;

That the attached Exhibits include letters and email correspondence between Audunn Ludviksson and outside counsel, Kristi L. Davidson, regarding preparation of the application, and between Audunn Ludviksson and us regarding final review of the application and execution of the declaration by each of us, and further include copies of the declarations bearing dates of execution by each of us, which clearly demonstrate that we and our legal representatives were diligent in constructively reducing the invention to practice from a date just prior to February 16, 2004 up to our filing date of March 10, 2004;

That the conception and diligence toward reduction to practice of the invention claimed in pending claims 1-9, 10-11, and 13-21 of the '876 application are fully supported by the attached Exhibits A and B, all acts having been performed in the United States;

That we have reviewed all documents in the Exhibits and believe all documents to be true and accurate;

That Exhibit A demonstrates that a draft application on our conceived invention was mailed from our in-house IP department, namely from Tug Yasar, to our outside counsel for review and revision prior to February 16, 2004 (date and other information masked);

That Exhibit B demonstrates that our outside counsel, Kristi L. Davidson, emailed a revised draft to Audunn Ludviksson of our in-house IP department prior to February 16, 2004 (date and other information masked);

That Exhibit C demonstrates that Audunn Ludviksson of our in-house IP department emailed a revised draft back to outside counsel, Kristi L. Davidson, on Friday, February 13, 2004, which is just prior to the February 16, 2004 publication date of *Cho et al.*,

this exhibit including a copy of the application attached to the email, as a clean version with red-line changes accepted and certain portions masked, evidencing conception of the invention claimed in our '876 application;

That Exhibit D demonstrates that our outside counsel, Kristi L. Davidson, emailed the final application to Audunn Ludviksson of our in-house IP department, with instruction to proceed with having the formal papers executed, on Monday, February 16, 2004, which is the same date as the publication date of *Cho et al.*;

That Exhibit E demonstrates that our outside counsel, Kristi L. Davidson, mailed by Federal Express a revised set of formal papers to Audunn Ludviksson of our in-house IP department on Tuesday, February 17, 2004;

That Exhibit F demonstrates that Audunn Ludviksson of our in-house IP department emailed us the final draft of the application and the Declaration and Assignment (formal papers), with instructions to review the application and, if we had no changes, to sign and date the Declaration and Assignment, on Wednesday, February 18, 2004, this exhibit including a copy of the application attached to the email, which application is identical to our '876 application filed on March 10, 2004;

That Exhibit G demonstrates that we, Anthony Dip, Sanjeev Kaushal, Seungho Oh, and Raymond Joe, signed the Declaration on Wednesday, February 25, 2004, after completing our review and determining that no changes were needed;

That Exhibit H demonstrates that I, Pradip Roy, signed the Declaration on Thursday, February 26, 2004, after completing my review and determining that no changes were needed;

That Exhibit I demonstrates that Audunn Ludviksson of our in-house IP department emailed Anthony Dip on Wednesday, March 3, 2004 to inquire as to the status of execution of the Declaration and Assignment, and that I, Anthony Dip, responded on Wednesday, March 3, 2004 that one of my co-inventors (Allen Leith) had been out on a field service call (i.e., had been out of the office at a customer facility so as to be unavailable to review the application and sign the formal papers) but had just returned on Wednesday, March 3, 2004, and that I thought that the fully executed Declaration would be sent on Thursday, March 4, 2004;

That Exhibit J demonstrates that I, Allen Leith, after being absent from the office due to an off-site customer service call, completed my review and, determining that no changes were needed, signed the Declaration on Friday, March 5, 2004;

That Exhibit K demonstrates that Audunn Ludviksson of our in-house IP department mailed the executed Declaration to our outside counsel, Kristi L. Davidson, on Tuesday, March 9, 2004, and that, according to the stamp, our outside counsel, Wood, Herron & Evans, received the signed Declaration at 10:21 a.m. on Wednesday, March 10, 2004, which is also the filing date of our '876 application, evidencing that our outside counsel diligently filed our application on the same day after receiving our signed Declaration;

That Exhibit C further demonstrates as follows:

That a method of forming a semiconductor device, the method comprising: providing a substrate; forming a SiGe surface layer on the substrate, wherein the average Ge content in the SiGe layer was less than about 10 at.%; depositing a high-k dielectric layer onto the SiGe surface layer; forming an oxide layer between the high-k dielectric layer and an unreacted portion of the SiGe surface layer, the oxide layer being

formed during one or both of said depositing and an annealing process after said depositing; and forming an electrode layer on the high-k dielectric layer, was conceived of prior to February 16, 2004;

That a method of forming a semiconductor device, the method comprising: providing a substrate; forming a SiGe surface layer on the substrate, wherein the average Ge content in the SiGe layer was less than about 10 at.%; depositing a high-k dielectric layer onto the SiGe surface layer; annealing the substrate having the SiGe surface layer and high-k dielectric thereon; and forming an electrode layer on the high-k dielectric layer, wherein at least one of the depositing and the annealing comprises exposing the substrate to an oxygen-containing gas to form an oxide layer between the high-k dielectric layer and an unreacted portion of the SiGe surface layer, was conceived of prior to February 16, 2004; and

That a semiconductor device comprising: a substrate having a SiGe surface layer with the average Ge content less than about 10 at.% and an unreacted portion; a high-k dielectric layer on the SiGe surface layer; an oxide layer between the high-k dielectric layer and the unreacted portion of the SiGe surface layer; and an electrode layer on the high-k dielectric layer, was conceived of prior to February 16, 2004;

That Exhibits C-K further demonstrate diligence from just prior to February 16, 2004 up to March 10, 2004;

Therefore, in summary, the attached Exhibits A-K disclose and support the conception and diligence to constructive reduction to practice of the semiconductor method and device that is the subject of and is claimed in Application No. 10/797,876, all the acts of which

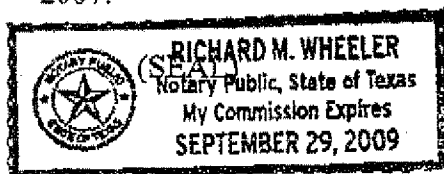
occurred in the United States, the act of conception occurring prior to February 16, 2004, and diligence occurring from just prior to February 16, 2004 continuously to the constructive reduction to practice on March 10, 2004, thus proving a date of invention prior to the publication date of *Cho et al.*

Further affiants saith naught.

By Anthony Dip
Anthony Dip
Date 1-25-07

STATE OF TEXAS)
COUNTY OF Texas)

Sworn to and subscribed in my presence this 25 day of JAN 2007.



[Signature]
Notary Public

By _____
Pradip K. Roy

Date _____

STATE OF CALIFORNIA)
COUNTY OF _____)

Sworn to and subscribed in my presence this _____ day of _____, 2007.

(SEAL)

Notary Public

occurred in the United States, the act of conception occurring prior to February 16, 2004, and diligence occurring from just prior to February 16, 2004 continuously to the constructive reduction to practice on March 10, 2004, thus proving a date of invention prior to the publication date of *Cho et al.*

Further affiants saith naught.

By Anthony Dip

Date _____

STATE OF TEXAS)

COUNTY OF _____)

Sworn to and subscribed in my presence this _____ day of _____, 2007.

(SEAL)

Notary Public

By Pradip K. Roy
Pradip K. Roy

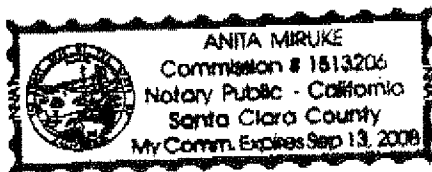
Date 1-25-07

STATE OF CALIFORNIA)

COUNTY OF Santa Clara)

Sworn to and subscribed in my presence this 25th day of January, 2007.

(SEAL)



Anita Miruke
Notary Public

By Sanjeev Kaushal
Sanjeev Kaushal

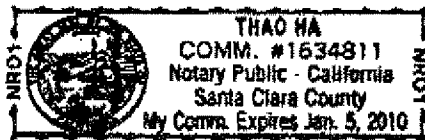
Date 01/26/07

STATE OF CALIFORNIA)

COUNTY OF Santa Clara)

2007.

(SEAL)



Thao Ha
Notary Public

By _____
Allen J. Leith

Date _____

STATE OF VIRGINIA)

COUNTY OF _____)

2007.

(SEAL)

Sworn to and subscribed in my presence this _____ day of _____,

Notary Public

STATE OF CALIFORNIA)
COUNTY OF _____)

Sworn to and subscribed in my presence this _____ day of _____, 2007.

(SEAL)

By _____
Sanjeev Kaushal

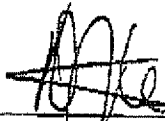
Date _____

Notary Public

STATE OF PENNSYLVANIA)
COUNTY OF LuZerne)

Sworn to and subscribed in my presence this 25th day of Jan, 2007.

(SEAL)

By 
Allen J. Leith

Date 1/25/2007


Notary Public

COMMONWEALTH OF PENNSYLVANIA
Notary Seal
Daniel A. Copertino, Notary Public
Wright Twp., Luzerne County
My Commission Expires Feb. 3, 2008
Member, Pennsylvania Association of Notaries



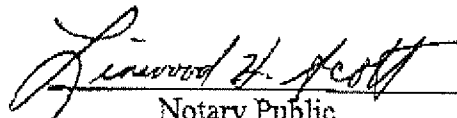
By 
Seungho Oh

Date 1-25-07

~~STATE OF TEXAS~~)
~~CITY~~)
~~COUNTY OF~~ RICHMOND)

Sworn to and subscribed in my presence this 25th day of JANUARY,
2007.

(SEAL)


Notary Public
MY COMMISSION EXPIRES 10-31-10

By _____
Raymond Joe

Date _____

STATE OF TEXAS)
COUNTY OF _____)

Sworn to and subscribed in my presence this _____ day of _____,
2007.

(SEAL)

Notary Public

By _____
Seungho Oh

Date _____

STATE OF TEXAS)
)
COUNTY OF _____)

Sworn to and subscribed in my presence this _____ day of _____,
2007.

(SEAL)

Notary Public

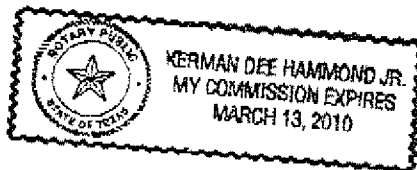
By _____
Raymond Lee

Date 26 Jan 2007

STATE OF TEXAS)
)
COUNTY OF TARRANT)

Sworn to and subscribed in my presence this 26 day of JAN,
2007.

(SEAL)



Notary Public.